CLAIMS

1. A tire monitor configured for mounting to a vehicle, the tire monitor comprising:

a tire condition sensor to produce a tire condition signal;

a controller coupled to the tire condition sensor to control operation of the tire monitor;

a radio circuit coupled to the controller to transmit radio signals based at least in part on the tire condition signal; and

a shock sensor coupled to the controller to produce a motion signal indicating motion of the tire monitor.

2. The tire monitor of claim 1 wherein the controller comprises a shock sensor interface configured to detect the motion signal produced by the shock sensor.

3. The tire monitor of claim 2 wherein the shock sensor interface includes at least one of an amplifier for amplifying the motion signal and a filter for filtering the motion signal.

4. The tire monitor of claim 1 further comprising an analog to digital converter coupled with the shock sensor to convert the motion signal to motion data for interpretation by the controller as an indication that the vehicle is stationary or in motion.

5. The tire monitor of claim 1 further comprising a comparator coupled with the shock sensor to produce an indication that the vehicle is stationary or in motion based on comparison of the motion signal and a predetermined threshold signal.

6. The tire monitor of claim 4 wherein the controller is configured to place the tire monitor in a low power sleep mode in response to interpretation by the controller of the motion data as an indication that the vehicle is stationary.

7. The tire monitor of claim 1 wherein the controller comprises:

a shock sensor interface to receive the motion signal produced by the shock sensor and produce an amplified motion signal;

an analog to digital converter coupled to the shock sensor to convert the amplified motion signal to motion data; and

a processor responsive to stored data and instructions to determine a motion condition of the vehicle based on the motion data.

8. A motion detection method in a tire monitor configured for mounting on a vehicle in a remote tire monitoring system including a receiver, the method comprising:

detecting an output signal of a shock sensor;

based on the output signal, making a current motion conclusion;

testing a last saved motion conclusion; and

if the current motion conclusion matches the last saved motion conclusion, transmitting data from the tire monitor for reception by the receiver.

9. The motion detection method of claim 8 wherein in transmitting comprises transmitting only when supervisory timing of the tire monitor permits transmission.

10. The motion detection method of claim 8 further comprising:

if the current motion conclusion and the last saved motion conclusion indicate motion of the tire monitor, testing a motion decisions counter; and

if the motion decisions counter exceeds a threshold, transmitting the data from the tire monitor.

11. The motion detection method of claim 10 further comprising:

if the motion decisions counter exceeds a threshold, entering a low power sleep mode before again detecting the output signal of the shock sensor.

12. The motion detection method of claim 8 further comprising:

if the current motion conclusion does not match the last saved motion conclusion, entering a low power sleep mode before again detecting the output signal of the shock sensor.

13. The motion detection method of claim 8 wherein detecting the output signal of the shock sensor comprises:

sensing the output signal of the shock sensor;

based on the output signal, concluding the tire monitor is stationary or in motion;

upon a stationary conclusion, comparing the stationary conclusion with a previous conclusion;

if the previous conclusion matches the stationary conclusion, making the current motion conclusion that the tire monitor is stationary;

if the previous conclusion does not match the stationary conclusion, re-sensing the output signal of the shock sensor;

based on the re-sensed output signal, re-concluding the tire monitor is stationary or in motion;

upon a stationary re-conclusion, making the current motion conclusion that the tire monitor is stationary; and

upon a moving re-conclusion, incrementing a motion decision counter.

14. The motion detection method of claim 8 wherein detecting the output signal of the shock sensor comprises:

sensing the output signal of the shock sensor;

based on the output signal, concluding the tire monitor is stationary or in motion;

upon a moving conclusion, comparing the moving conclusion with a previous conclusion;

if the previous conclusion matches the moving conclusion, making the current motion conclusion that the tire monitor is moving;

if the previous conclusion does not match the moving conclusion, re-sensing the output signal of the shock sensor;

based on the re-sensed output signal, re-concluding the tire monitor is stationary or in motion;

upon a moving re-conclusion, clearing a motion decision counter; and

upon a stationary re-conclusion, making the current motion conclusion that the tire monitor is stationary.

15. The motion detection method of claim 8 wherein detecting the output signal of the shock sensor comprises:

sampling the output signal of the shock sensor a plurality of times;

if a predetermined number of output signal samples exceed a threshold, incrementing a counter;

re-sampling the output signal of the shock sensor a second plurality of times;

if a second predetermined number of output signal samples exceed the threshold, incrementing the counter;

if the counter has been incremented twice, concluding setting a motion status flag to a moving value; and

otherwise, setting the motion status flag to a stationary value.

16. The motion detection method of claim 15 further comprising:

waiting a predetermined time duration between sampling and re-sampling the output signal.

17. The motion detection method of claim 8 wherein detecting the output signal of a shock sensor comprises:

alternately detecting an output signal of a first shock sensor and detecting an output signal of a second shock sensor.

18. A tire monitor operable in a remote tire monitoring system and mountable on a wheel of a vehicle including the system, the tire monitor comprising:

a pressure sensor;

a radio circuit;

at least one shock sensor; and

a control circuit coupled with the pressure sensor, the radio circuit and the at least one shock sensor.

19. The tire monitor of claim 18 wherein the control circuit comprises:

a microprocessor core;

a pressure sensor interface;

a shock sensor interface; and

an analog to digital converter coupled between the pressure sensor interface and the shock sensor interface and the microprocessor core.

20 The tire monitor of claim 19 further comprising:

a transponder,

the control circuit further comprising a transponder interface coupled to the microprocessor core.

21 The tire monitor of claim 18 wherein the at least one shock sensor produces a substantially periodic signal in response to rotation of the wheel, the control circuit being responsive to the substantially periodic signal to determine a motion state of the tire monitor.

22 The tire monitor of claim 18 wherein the at least one shock sensor produces a resonant signal in response to motion of the at least one shock sensor, the control circuit being responsive to the resonant signal to determine a motion state of the tire monitor.

23 The tire monitor of claim 18 wherein the at least one shock sensor produces a wideband noise signal in response to motion of the at least one shock sensor, the control circuit being responsive to the wideband noise signal to determine a motion state of the tire monitor.

24 ~~23~~. A tire monitor method for use in a tire monitor including a control circuit and a plurality of motion sensors, the method comprising:

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(a) detecting an output signal of a first motion sensor;

(b) based on the first motion sensor output signal, making a motion conclusion about motion of the tire monitor;

(c) detecting an output signal of a second motion sensor;

(d) based on the second motion sensor output signal, making a motion conclusion about motion of the tire monitor;

(e) repeating (a) through (d) until motion of the tire monitor is detected based on one of the first motion sensor output signal and the second motion output signal.

25 ~~24~~. The tire monitor method of claim ~~23~~ 24 wherein detecting the output signal comprises detecting the output signal of a shock sensor.

26 ~~25~~. The tire monitor method of claim ~~23~~ 24 wherein the method further comprises continuing to detect the first and second motion sensor output signals after motion of the tire monitor is detected.